



Design and Development of a Training Management Application at PT. XYZ

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Abstract. Employee competency training license data management for Environment Safety and Health (ESH) is a critical aspect of data management at PT. XYZ. This research aims to develop a web-based Training Management Application to digitize employee training data management, which was previously conducted manually using Microsoft Excel. The Waterfall design methodology was employed in the application development, analysis, system design, implementation of the application, testing, and maintenance phases. This application was developed using ASP.NET MVC and Entity Framework Core, featuring key functionalities such as employee training license data management, detailed training information, and an automatic email notification system as a reminder. Upon completion of the application development, a System Usability Scale (SUS) evaluation was conducted to measure the application usability. The research results demonstrate that the Training Management Application successfully improved the efficiency and accessibility of employee training data management, while also providing better information compared to the previous manual system.

Keywords: training management, digitalization, web application, ASP.NET, System Usability Scale (SUS).

1 Introduction

1.1 A Subsection Sample

In the current digital era, managing employee training data has become crucial for companies [1]. PT. XYZ, particularly the Environment Safety and Health (ESH) department, previously managed training license data related to safety manually using Microsoft Excel, which faced challenges in data management and organization. This often resulted in poorly organized data, affecting the effectiveness of data collection and training information dissemination.

Based on government regulation section 12.1.6 regarding "Employers or managers documenting and maintaining records of all training" in "Government Regulation of the Republic of Indonesia Number 50 of 2012 Concerning the Implementation of Occupational Safety and Health Management Systems," companies are required to properly document and maintain training records [2].

To address this issue, the Training Management Application was developed as a web-based solution that facilitates the management and access to training information for all departments at PT. XYZ. The main features of this application include managing employee training license data related to Occupational Safety and Health, detailed training information, and an automated email system as a reminder when training licenses are about to expire. Managing training license data through this application is important in ensuring easy access to information related to Occupational Safety and Health [1] [3].

This research aims to design and develop a Training Management Application using the Waterfall design method and ASP.NET 8 MVC to manage employee training license data in an integrated and user-friendly manner. After development, a System Usability Scale (SUS) evaluation will be conducted to measure the usability of the application [4].

By digitizing the management of Occupational Safety and Health (OSH) training license data from a manual system to a web-based one, this application enhances usability and facilitates accessibility and ease of information dissemination at PT. XYZ.

2 Literature Review

2.1 Relevant Research

Several studies have been conducted in the field of web-based management systems and training applications. Inneke Vincentia, et al. (2023) analyzed a web-based management information system design to improve the effectiveness and efficiency of the new employee recruitment process in a fast-moving consumer goods (FMCG) company in DKI Jakarta. Their study demonstrated the benefits of web systems in enhancing the ease of data management processes, similar to employee training management applications.

Maimunah, et al. (2020) focused on the design of a web-based training management information system at PT. Sintech Berkah Abadi. Their research discussed the development of a web-based training management system that facilitated training data management and dissemination of training information to employees.

Enry Christanto, Tony Wibowo, et al. (2020) conducted a comparative analysis of web application performance, specifically studying ASP.NET MVC and ASP.NET Core. Their research provided examples of ASP.NET Core implementation in information systems, which is particularly relevant to our project's use of ASP.NET Core MVC for the Training Management Application.

These studies collectively highlight the growing importance of web-based systems in managing various aspects of employee data, including training and provide valuable insights into the implementation of technologies such as ASP.NET in developing information systems.

2.2 Theoretical Foundation

Windows Task Scheduler. Windows Task Scheduler is a tool that allows users to automate routine tasks on Windows computers. With Task Scheduler, users can schedule various tasks such as running applications, sending emails, or displaying messages based on specific times or triggers [5].

One practical use of Task Scheduler is to run applications periodically every hour to keep them active and prevent idle time. Users can set up a schedule in Task Scheduler that will run a script to ping the application periodically. This is important to ensure the application keeps running and remains responsive without requiring manual intervention.

ASP.NET Core MVC for Web Application Development. ASP.NET Core MVC is a modern framework for building dynamic and high-performance web applications. This framework follows the Model-View-Controller (MVC) pattern, which aims to break down the application into Model, View, and Controller components for a more organized structure and ongoing maintenance [6]. ASP.NET Core MVC offers high performance, development flexibility, and strong support for cloud-based development and test-oriented development to improve code quality [7].

In the context of the Training Management Application at PT. XYZ, ASP.NET Core MVC provides a robust foundation for developing applications that are easy to develop and responsive to employee training and administration needs [7]. The use of this framework aligns with company technology standards, accommodates dynamic business needs, and allows the application to operate on various platforms.

Microsoft SQL Server. Microsoft SQL Server offers a powerful and efficient solution in data management as a database [8] for the Training Management Application at PT. XYZ, while also following company technology standards. Microsoft SQL Server continues to evolve towards greater interoperability and high performance for applications and has several important features such as database recovery and backup [9].

The integration between Microsoft SQL Server and ASP.NET Core MVC is crucial in this application. Microsoft's focus on unifying the code base between .NET Framework and .NET Core provides advantages in developing versatile applications and improving performance and scalability [10].

3 Research Methodology

3.1 Software Design Method

Waterfall. In developing the Training Management Application at PT. XYZ, the waterfall method was chosen as the primary approach. The waterfall method, also known as the classic life cycle model, is a structured and sequential software development methodology [11]. This approach is suitable for projects with clear and well-defined requirements.

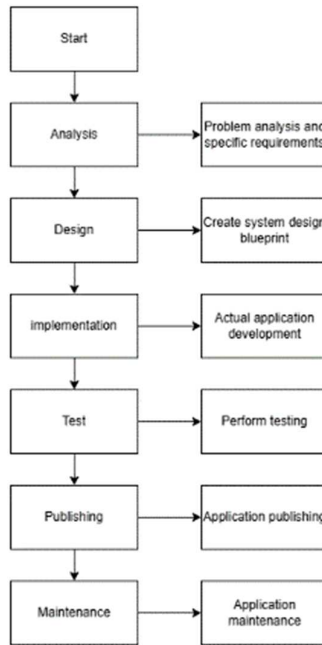


Fig. 1. Stages flow of the Waterfall method

The waterfall method is divided into several sequential phases, where each phase must be completed before moving on to the next. This ensures that every aspect of the application is handled thoroughly [12]. These phases include:

1. **Analysis:** This initial stage involves a deep understanding of the application requirements. In this context, analysis was conducted to understand the problems experienced by Environment Safety and Health (ESH) department and the specific needs of it.
2. **Design:** After the requirements are defined, the design phase begins. Here, the application architecture, including the choice of framework, database, libraries, and user interface design, is outlined.
3. **Implementation:** At this stage, the actual application development is carried out. Using ASP.NET Core MVC, Entity Framework Core, and other specified technologies.
4. **Testing:** After the application is developed, functionality testing is conducted using Blackbox testing to test whether the functionality works well and optimally [13]. Subsequently, the application's usability aspect evaluation will be carried out using the System Usability Scale (SUS) method.
5. **Deployment:** This stage involves publishing the application to the IIS server, allowing the application to be used in the operational environment at PT. XYZ.
6. **Maintenance:** Ongoing maintenance is carried out to ensure the application remains up-to-date and functions well in the long term.

The waterfall method provides several advantages, including a clear structure, ease of management, and detailed documentation [14]. This will allow the development process to work in a more organized and systematic manner, ensuring that all project requirements and objectives are effectively met.

3.2 Quantitative Analysis Method

System Usability Scale (SUS). Usability is a crucial aspect in application development that determines how easily and effectively users can interact with the system [15]. The System Usability Scale (SUS) is an effective technique for measuring the usability aspect of an application. Previous studies have shown how SUS is used to evaluate an application to measure usability, user satisfaction, and areas that need improvement [16].

SUS uses a Likert scale with a range of values from 1 to 5 for each question, where a value of 1 represents "Strongly Disagree" and a value of 5 represents "Strongly Agree" [17]. The following is the score assessment for each answer in SUS:

Table 1. SUS Score Assessment

Answer	Score
Strongly Disagree	1
Disagree	2
Neutral / Unsure	3
Agree	4
Strongly Agree	5

The SUS questionnaire consists of 10 statements that will be answered by users to evaluate the usability of the application [17]. Here is the list of statements in the SUS questionnaire that will be distributed:

Table 2. SUS question list

Item	Question
Q1	I think that I would like to use this system frequently
Q2	I found the system unnecessarily complex
Q3	I thought the system was easy to use
Q4	I think that I would need the support of a technical person to be able to use this system
Q5	I found the various functions in this system were well integrated
Q6	I thought there was too much inconsistency in this system
Q7	I would imagine that most people would learn to use this system very quickly
Q8	I found the system very cumbersome to use

Q9	I felt very confident using the system
Q10	I needed to learn a lot of things before I could get going with this system

To calculate the SUS score, a special formula is used that involves all answers from the 10 questionnaire questions. For odd-numbered questions (Q1, Q3, Q5, Q7, Q9), the score is calculated by subtracting 1 from the answer value. For even-numbered questions (Q2, Q4, Q6, Q8, Q10), the score is calculated by subtracting the answer value from 5 [17].

After obtaining the score for each question, the next step is to sum up all these scores. This sum is then multiplied by 2.5 to get the final SUS score.

After calculating the SUS score for each respondent, the last step is to calculate the average SUS score from all respondents. The formula for calculating the average SUS score is as follows:

$$\bar{x} = \frac{\sum X}{n} \tag{1}$$

Where:

\bar{x} = average SUS score

$\sum x$ = sum of SUS scores

n = number of respondents

4 Results and Discussion

4.1 System Design

System Overview. The following is an overview of the system for the Application:

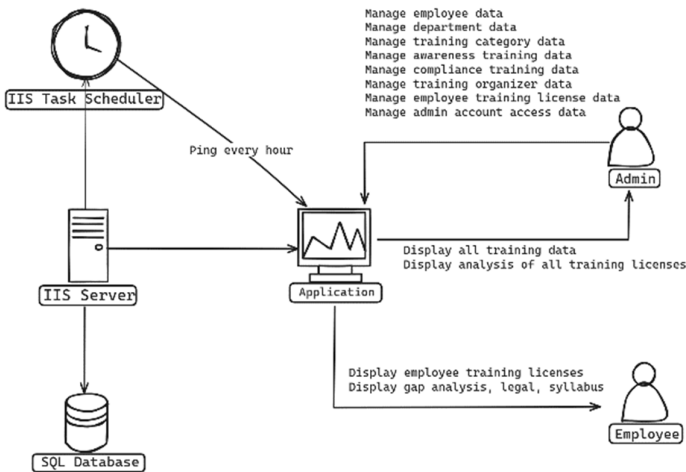


Fig. 2. System Overview

This system overview is designed to meet the needs of Admin and employees with different access and functions according to their respective roles. Employees can only view their personal training license list and training information, while Admins are responsible for managing data related to training and employee licenses. The application runs on an IIS Server with Microsoft SQL as the database, provided by PT. XYZ to maintain internal data security. There is a Task Scheduler feature on the IIS Server that keeps the application from shutting down due to idle timeout, especially to support the automatic email sending function that runs at specific time.

System Requirements

Functional Requirements. Functional requirements refer to the basic capabilities that the system must perform to meet operational objectives [18].

Table 3. Functional Requirements

ID	Functional Requirement	Description
F1	Manage employee data	Admin can add, delete, and modify employee data.
F2	Manage department and category data	Admin can add, delete, and modify department and category data.
F3	Manage awareness, compliance and organizer training data	Admin can add, delete, and modify data related to awareness, compliance and organizer training.
F4	Manage employee training license data	Admin can add, delete, and modify data related to employee licenses.
F5	Manage admin account access data	Admin can add, delete, and modify admin access data for the application.
F6	View syllabus, legal, and training-related analysis	Employees can view all available training and see related data on it.
F7	View personal training license list	Employees can view their personal training license list.

Non-Functional Requirements. These non-functional requirements relate to characteristics or constraints that must be met by the system apart from its main functions, such as security, performance, scalability, compatibility, and ease of maintenance [18].

Table 4. Non-Functional Requirements

ID	Non-Functional Requirement	Description
NF1	Internal Security	Ensuring the security and safeguarding of data, which can only be accessed within the company's intranet using Windows authentication.
NF2	Performance	Fast data processing by implementing server-side table.
NF3	Language	The application is available only in English.

NF4	Browser Compatibility	The application is compatible with all modern browsers.
NF5	Platform Compatibility	The application is compatible with most of modern OS.

Use Case. The use of Use Case scenarios in this system aims to map each action that can be executed by users in interaction with the Application [19]. The following is the Use Case diagram of the application:

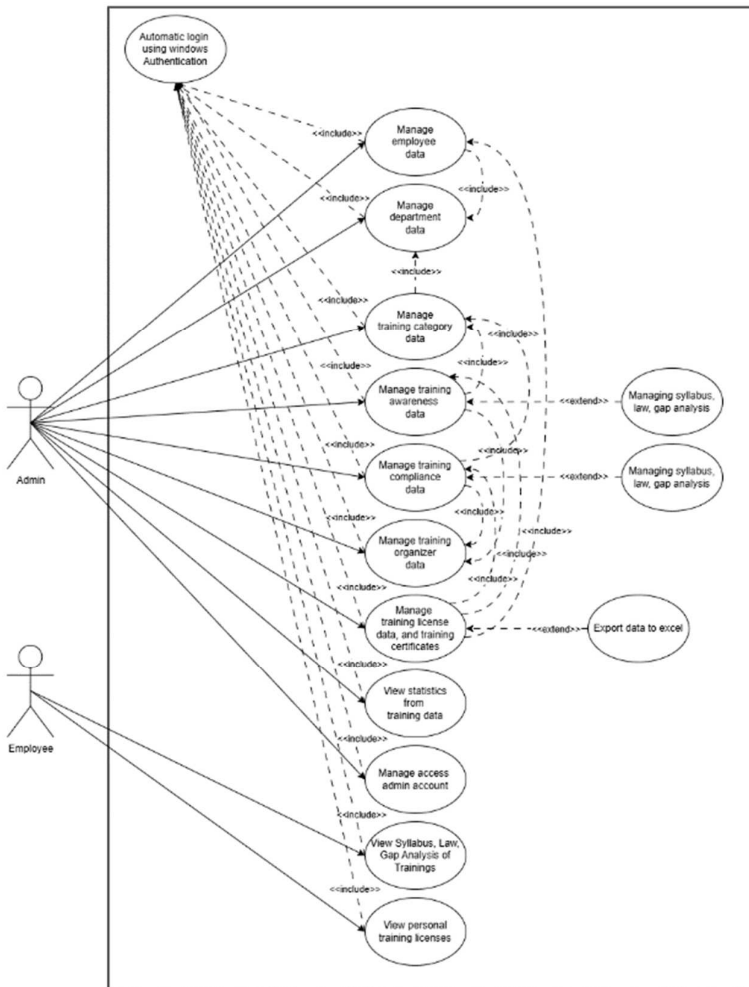


Fig. 3. Use Case Diagram

Entity Relationship Diagram. The ERD illustrates data structure and relationships, ensuring proper data management and integrity.

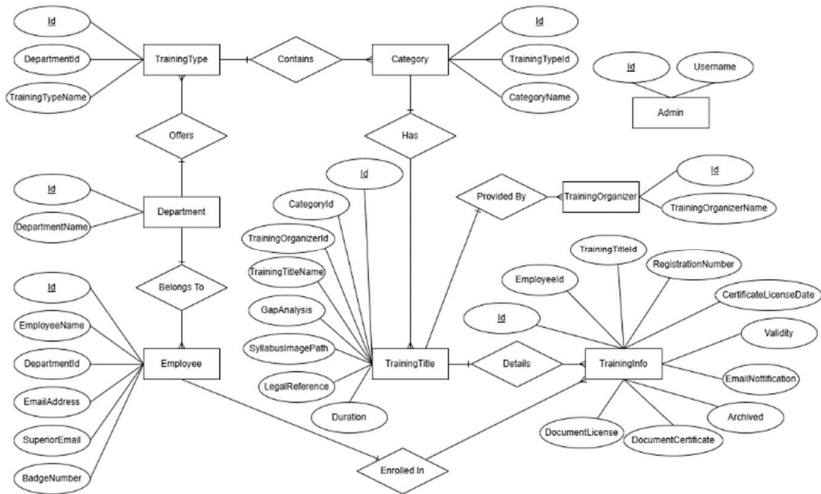


Fig. 4. Entity Relationship Diagram

4.2 Implementation Results

Personal Page. The first page displayed after the user performs automatic authentication using their Windows account is the page to enter the employee badge number. On this page, users can enter their badge number to access the list of training licenses associated with that employee

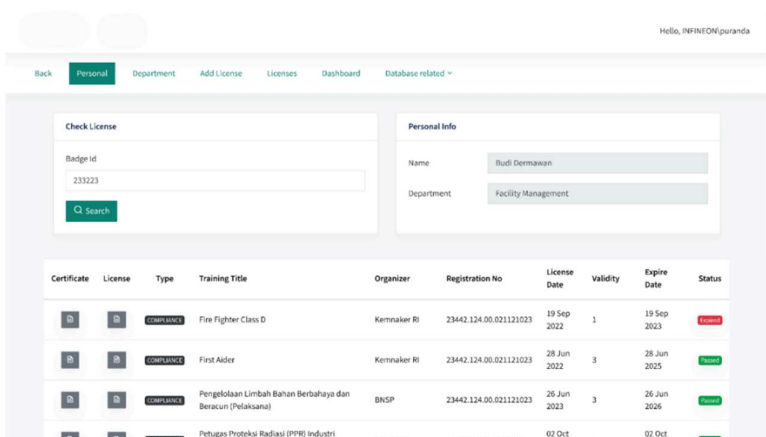


Fig. 5. Personal Page Display showing employee licenses

Department Page. The following is the Department page which presents four dropdowns to select department, type, category, and training name. After these options are selected, the page will display related information such as applicable laws, gap analysis, human resource requirements, duration in minutes, and syllabus of the selected training.

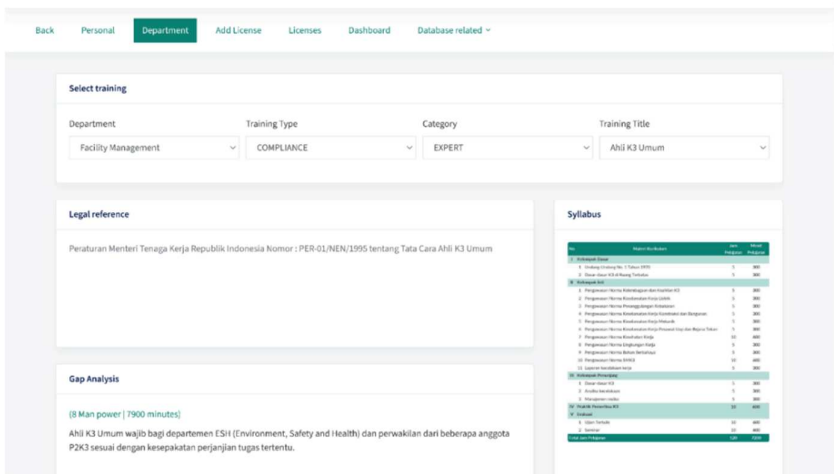


Fig. 6. Department Page Display

Add License Page (Admin). The following is the display of the page for adding a new training license for an employee. This form allows the admin to enter information such as employee name, department, type, category, training name, organizer, registration number, effective date, validity period, scanned license file, and scanned training certificate file.

The screenshot shows a web form titled "Add License to Employee". The form is part of a navigation menu with options: Back, Personal, Department, Add License (highlighted), Licenses, Dashboard, and Database-related. The form fields are as follows:

- Name: Select Employee (dropdown)
- Department: (dropdown)
- Training Type: Select (dropdown)
- Category: Select (dropdown)
- Training Title: Select (dropdown)
- Training Organizer: (dropdown)
- Registration No.: Type here (text input)
- Certificate License Date: mm/dd/yyyy (date picker)
- Validity: Select (dropdown)
- Document Certificate: Choose File (file upload) - No file chosen
- Document License: Choose File (file upload) - No file chosen
- Email Notification: Reminder

Buttons at the bottom: "Add Training License" (green) and "Back to List" (white).

Fig. 7. Add License Page Display

Licenses Page (Admin). This page presents an admin page that provides comprehensive information related to the list of training licenses held by all employees in the company. Admins also have the authority to modify existing license data, either in the form of changes or deletion of certain licenses.

The screenshot shows the "Licenses" page with a table of training licenses. The table has the following columns: Badge, Name, Department, Training Title, Organizer, Registration Number, License Date, Validity (years), Expire Date, Status, and Actions. The data is as follows:

Badge	Name	Department	Training Title	Organizer	Registration Number	License Date	Validity (years)	Expire Date	Status	Actions
1231231	Jenova Berrang	Facility Management	Pengendalian Pencemaran Udara dan Emisi (Pengendalian Jarak)	ENSP	No. Reg. ENK.1445.2262020	2020/11/23	3	2023/11/23	Active	Edit Delete
3343434	Devi Jansen Rizki	Facility Management	Pengendalian Pencemaran Air (Pengendalian Jarak)	ENSP	No. Reg. ENK.013.01804.2023	2020/12/14	3	2023/12/14	Active	Edit Delete
1231231	Syahrul Budimas	Assembly - Engineering	MPRES for Non-Executive	Internal	No. Reg. ENK.1445.2262020	2023/01/01	2	2025/01/01	Active	Edit Delete
3434355	Sukuningsih Harahab	Assembly - Engineering	MPRES for Non-Executive	Internal	No. Reg. ENK.1445.2262020	2023/01/01	2	2025/01/01	Active	Edit Delete
1231245	Morisa Dewi	Assembly - Engineering	MPRES for Non-Executive	Internal	No. Reg. ENK.1445.2262020	2023/01/01	2	2025/01/01	Active	Edit Delete
430102	Rika Delli	Assembly - Engineering	MPRES for Non-Executive	Internal	No. Reg. ENK.1445.2262020	2023/01/01	2	2025/01/01	Active	Edit Delete
231233	Harahul Mera	Assembly - Engineering	MPRES for Non-Executive	Internal	No. Reg. ENK.1445.2262020	2023/01/01	2	2025/01/01	Active	Edit Delete
4545466	Agastri Cristian	Assembly - Engineering	MPRES for Non-Executive	Internal	No. Reg. ENK.1445.2262020	2023/01/01	2	2025/01/01	Active	Edit Delete
1232124	Yeni Yeni	Assembly - Engineering	MPRES for Non-Executive	Internal	No. Reg. ENK.1445.2262020	2023/01/01	2	2025/01/01	Active	Edit Delete
0804340	Irya Rahmawati	Assembly - Engineering	MPRES for Non-Executive	Internal	No. Reg. ENK.1445.2262020	2023/01/01	2	2025/01/01	Active	Edit Delete

Showing 11 to 20 of 252 rows | 15 rows per page | 1 2 3 4 5 ... 253

Fig. 8. Licenses Page Display

Dashboard Page (Admin). The following is the admin dashboard page display that shows several important pieces of information related to registered training licenses,

such as the total number of licenses, the number of valid licenses, the number of expired licenses, and the number of licenses approaching expiration.

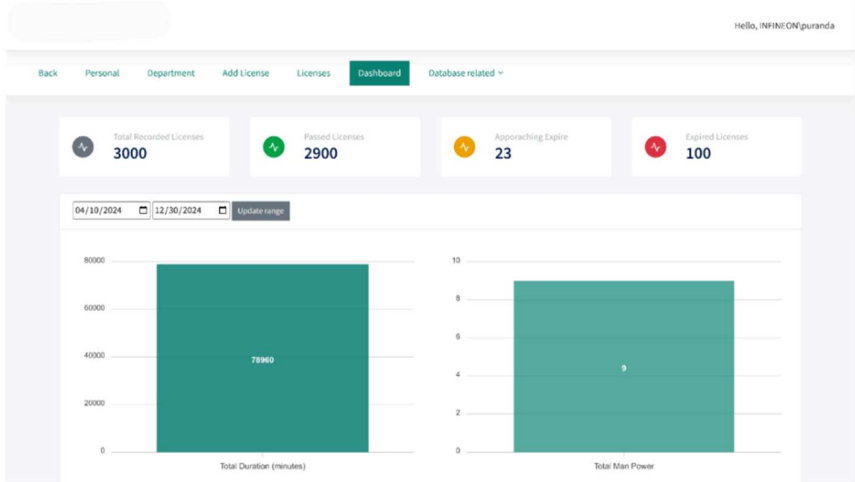


Fig. 9. Dashboard Page Display

Training Compliance Page (Admin). The following is a page for managing training with the Compliance type. On this page, admins can perform operations to add, modify, and delete compliance training, as well as perform bulk edits to change multiple data at once.

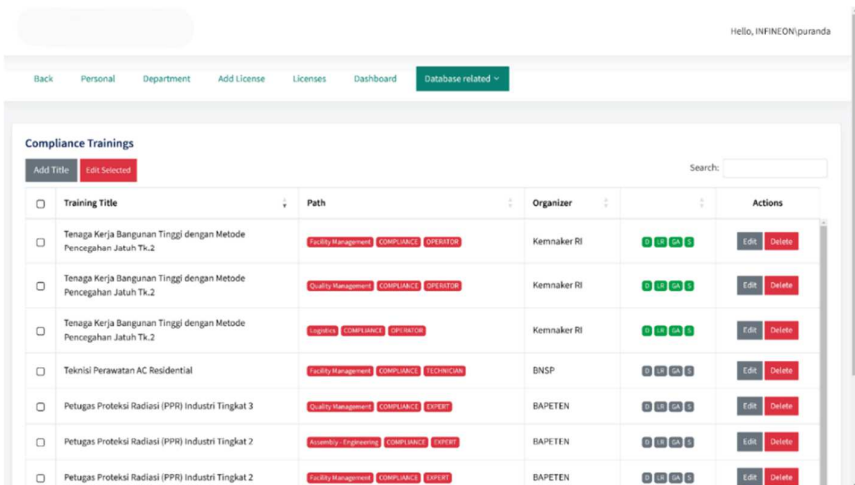


Fig. 10. Training Compliance Page Display

License Reminder Notification Email. The following is the display when there is a training license that is about to expire.

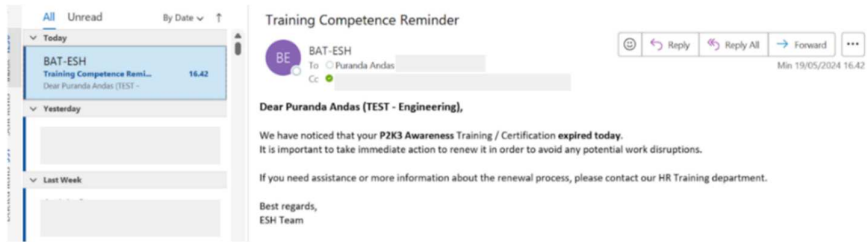


Fig. 11. Notification Email Display

4.3 Blackbox Testing

To ensure the functionality of the application, Blackbox testing was conducted involving two validators. This testing focused on the expected input/output of each feature and process in the application. The testing covered various aspects including automatic login, viewing personal training license lists, accessing training information, performing create, edit and delete on the data and email notification functionality.

The results of the Blackbox testing showed that all tested functionalities performed as expected. Both validators confirmed that each feature of the Training Management Application operated correctly according to its intended purpose. This comprehensive validation ensures that the application meets its functional requirements and is ready for implementation.

4.4 System Usability Scale (SUS) Results

After the application was developed, user testing was conducted using the System Usability Scale (SUS) to evaluate the usability aspect. Each question in the SUS questionnaire has a rating scale of 1 to 5, with details of the SUS score assessment as shown in Table 2. Subsequently, the researcher distributed the SUS questionnaire consisting of 10 questions according to the SUS question list in Table 3 to 30 respondents [20], namely employees of PT. XYZ.

The following is a summary of the questionnaire results and SUS scores from 30 respondents:

Table 5. SUS Questionnaire Results

Resp.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Sum	Score
R01	4	1	4	1	5	1	4	1	4	2	35	88
R02	4	2	5	1	4	1	5	1	4	2	35	88
R03	4	1	4	4	4	2	3	2	4	4	26	65

Resp.	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Sum	Score
R04	5	1	5	1	4	2	3	1	5	2	35	88
R05	5	1	5	2	5	2	5	1	5	4	35	88
R06	4	1	5	2	5	2	5	2	4	2	34	85
R07	4	2	4	2	4	2	4	2	5	4	29	73
R08	4	2	4	2	4	2	4	2	4	3	29	73
R09	5	2	4	2	5	1	4	2	4	3	32	80
R10	2	2	4	2	4	2	4	2	4	2	28	70
...
R30	5	1	5	2	5	1	5	1	5	1	39	98
SUS Average Score											2395 : 30 = 80	

From the calculation results, the Training Management Application at PT. XYZ obtained an average SUS score of 80. Based on the score interpretation, a score of 80 falls into the Excellent category with an Adjective Rating of "Excellent", a Grade Scale of B, and an acceptance range classified as Marginal High. This indicates that the Training Management Application at PT. XYZ is already good and well-accepted by the respondents.

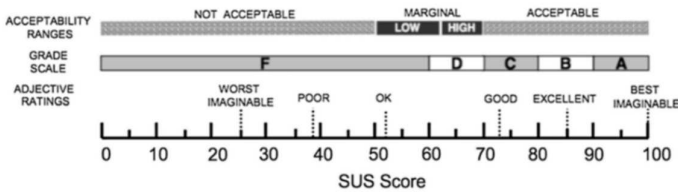


Fig. 12. SUS Score Range

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